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| ***MLA header:*** | **Student:**  Student did not submit the assignment.  ***Ms. Mitrovich***  **Honors Geometry, Period \_\_\_\_\_**  **Final Draft: Tuesday, 2 December 2014** | |
| **Assignment:** | Area & Perimeter Discovery (Performance Task) | |
| **Assignment Summary:** | You now know the basic concepts of perimeter & area. This performance task is an opportunity to look closer at the relationship between circumference and diameter. As well as an opportunity to connect quadratic equations to maximizing the area of a rectangle.  This performance task will be worth 60 points. The performance task will be broken into two tasks (circles and rectangles) as outlined in the procedure section. | |
| **Role:** | You are writing as a mathematician. You are exploring the relationship between different measurements of circles and rectangles, and generalizing rules about these shapes from your observations. | |
| **Audience:** | Your audience members are your teachers and fellow classmates. | |
| **Format:** | -5 points for not following these procedures:   * **All work shown *to scale* on centimeter graph paper.** * **Paragraph portion *typed*, 1-inch margins, double spaced**   (11 point Calibri or 12 point Times New Roman)   * No excessive spacing of lines or margins | -2 points for these format errors:   * Staple assignment sheet in front of your typed paper and all graph paper in the back * Indent the beginning of the paragraph * MLA format heading on both typed & graph papers |
| **Materials:** | * Graph paper– print your own at [teachervision.com/math/printable/6170.html](https://www.teachervision.com/math/printable/6170.html) * Area & Perimeter data table sheet (x2, one for circles, one for rectangles) * ~4 feet of string (provided) – if you lose it, you’ll have to re-start calculations with a new string. * Ruler with inches & centimeters. | |
| **Procedure:** | **I. Circumference** ~ Cut your string into 3 different-sized lengths. For ***each*** string, complete these steps:   1. Measure each length & record in your chart. Give all lengths including fractions, then decimals. 2. Make a circle on a flat surface out of the string segment, making the length of the string into the circumference. 3. Measure the diameter of each circle with a ruler (inch side). Make an erasable mark for diameter on the ruler. 4. To calculate the **visual** estimate of C/d (how long the string is in relationship to the diameter), fold the string back & forth on your ruler for the length of the diameter. Measure to 16ths of an inch, then calculate decimals. 5. To calculate the **algebraic** estimate of C/d, divide the circumference (string length) by the diameter of the circle. 6. Use the averages of C/d to create a formula for perimeter. 7. Draft & type ¶1 answering this: ***What appears to be the relationship of the diameter of any circle, regardless of size, to its perimeter? What formula can be derived from your observations?***   **II. Rectangle Area & Perimeter** ~ Pick **two** of your three strings and complete these steps (twice)   1. Create a rectangle with lengths and widths that are whole numbers. Draw & label your rectangle on centimeter graph paper. 2. Measure & label the length & width on graph paper, then record in your chart. 3. Repeat with same string, creating as many different rectangles as you can with whole number side lengths.   *Hint: Start with 1, and increase by 1 each time.*   1. Calculate the area of your rectangles. 2. Draft & type ¶2 answering this: ***Is there a relationship between perimeter & area of a rectangle? If so, what is it? If not, what characteristic(s) produce(s) the greatest area for a rectangle of any given perimeter?***   Use the remaining string to complete the following steps to maximize the area:   1. Set equation for perimeter equal to the length of your remaining string. 2. Solve the equation for length in terms of width. 3. Substitute the equation in for length in the area formula. 4. Combine like terms.   10. Graph the equation. **What does the y-axis represent? What does the x-axis represent? How can you graphically determine the maximum area? Does your answer make sense after the trend you observed in the previous section?**  11. Draft & type ¶3 answering this: **Your neighbor wants to put in a new fence in his backyard. He has 36 feet of fencing. Based on what you learned about maximizing area—how would you advise him?**  **III. Submission Details:**   1. Print your **final draft** & submit it in class. **(due Tues, 2 Dec 2014).**  * ***If you are absent****, email paper to your teacher (*[rmitrovich@noblenetwork.org](mailto:rmitrovich@noblenetwork.org) *) by 8am on the due date or it will be considered late.*  1. **Submit** your typed paper portion on [**www.turnitin.com**](http://www.turnitin.com). (due 2 Dec ***before* 7:50am**). | |

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| **Category** | | **A – Exceeding**  (9-10/10 or 5/5) | **B - Meeting**  (8/10 or 4/5) | **C - Approaching**  (7/10 or 3.5/5) | **D - Baseline**  (6/10 or 3/5) | **F – Unacceptable**  (0-5/10 or 0-2.5/5) | **Points:** |
| **I. Circles** | **Data Set** | * All perimeter & diameter lengths match (fraction to decimal) to hundredths. * All diameter measures are reasonable to perimeter. * All visual and algebraic estimates within 1/10 length & within .5 of each other. | * Most perimeter & diameter lengths match, at least to tenths. * Diameter measures are fairly reasonable (≤⅓ perimeter). * All visual and algebraic estimates within 1 inch of each other. | * Most perimeter & diameter lengths match, at least to inches. * Most diameter measures are reasonable. * All visual and algebraic estimates within 1 inch of each other. | * Perimeter & diameter are in fraction & decimal. * Diameter measures are <½ perimeter. * Algebraic estimates are within 1 point of correct answer. | * Perimeter & diameter both given. * Diameter measures are < perimeter. * Algebraic estimates are significantly different (>1 point) | \_\_\_\_\_\_/10 |
| **Formula** | * Average is reasonable. * Formula is accurate. | * Formula is accurate for the average given. | * Formula is accurate for the average given. | * Some algebra errors or * is used, not average | * Significant algebraic errors. | \_\_\_\_\_\_/5 |
| **Write-up** | * Answers questions thoroughly * Mathematical terminology used accurately throughout. * Accurate conclusions drawn about diameter & perimeter. * 0-1 convention mistakes. | * Answers questions correctly. * Mathematical terminology generally used. * Draws conclusions about diameter & perimeter. * 2-3 convention mistakes. | * All questions answered. * Academic terminology generally used. * Some conclusions about diameter & perimeter. * 4-5 convention mistakes. | * Most questions answered. * Some informal language. * Addresses diameter & perimeter. * 5-7 convention mistakes. | * Some questions not addressed. * Informal language. * ≥8 convention mistakes. | \_\_\_\_\_\_/10 |
| **II. Rectangles** | **Data Set** | * Centimeter measurements. * All rectangles have same perimeter, and length & width add up to perimeter. * Formula is correct. * All areas correctly calculated. | * Centimeter measurements. * All rectangles have same perimeter, and most have reasonable measures. * Formula is correct. * Most areas correctly calculated. | * All rectangles have same perimeter, and most have reasonable measures. * Formula is correct. * Few calculation errors. | * Most rectangles have reasonable measures. * Formula may be absent or incorrect. * Some area calculation errors. | * All rectangle measures given. * Significant area calculation errors. | \_\_\_\_\_\_/10 |
| **Graph Paper** | * All rectangles are drawn **to scale** on graph paper. * All rectangles labeled fully. * Area function is correctly graphed and labeled * The maximum area and corresponding length/ width is correctly determined | * All rectangles are drawn **to scale** on graph paper. * Rectangles are labeled. * Area function is graphed and labeled * The maximum area and corresponding length/ width is correctly determined | * All rectangles are drawn **to scale** on graph paper. * Rectangles are labeled. * Area function is graphed and labeled * The maximum area and corresponding length/ width is determined | * All rectangles are drawn on graph paper, but not to scale (centimeters) * Area function is not graphed * The maximum area and corresponding length/ width is missing | * Shapes are drawn, but may not be accurate. * Area function was not determined * The maximum area and corresponding length/ width is missing | \_\_\_\_\_\_/5 |
| **Write-up**  **(Data table questions)** | * Answers questions thoroughly * Mathematical terminology used accurately throughout. * Accurate conclusions drawn about perimeter & area. * 0-1 convention mistakes. | * Answers questions correctly. * Mathematical terminology generally used. * Draws conclusions about perimeter & area. * 2-3 convention mistakes. | * All questions answered. * Academic terminology generally used. * Some conclusions about area of a rectangle. * 4-5 convention mistakes. | * Most questions answered. * Some informal language. * Addresses area of a rectangle. * 5-7 convention mistakes. | * Some questions not addressed. * Informal language. * ≥8 convention mistakes. | \_\_\_\_\_\_/10 |
| **Write-up**  **(Situation)** | * Answers questions thoroughly * Correctly and concisely explains the process to maximize the area. * Mathematical terminology used accurately throughout. * Accurate conclusions drawn about perimeter & area. * 0-1 convention mistakes. | * Answers questions correctly. * Correctly explains the process to maximize the area. * Mathematical terminology generally used. * Draws conclusions about perimeter & area. * 2-3 convention mistakes. | * All questions answered. * Explains the processes to maximize the area. * Academic terminology generally used. * Some conclusions about area of a rectangle. * 4-5 convention mistakes. | * Most questions answered. * Explains the processes to maximize the area. * Some informal language. * Addresses area of a rectangle. * 5-7 convention mistakes. | * Some questions not addressed. * Answers the question but does not explain the process. * Informal language. * ≥8 convention mistakes. | \_\_\_\_\_\_/10 |
|  |  | | | **Total Score:** \_\_\_\_\_\_\_\_\_\_ /60 = \_\_\_\_\_\_\_\_\_\_ % | | | |